



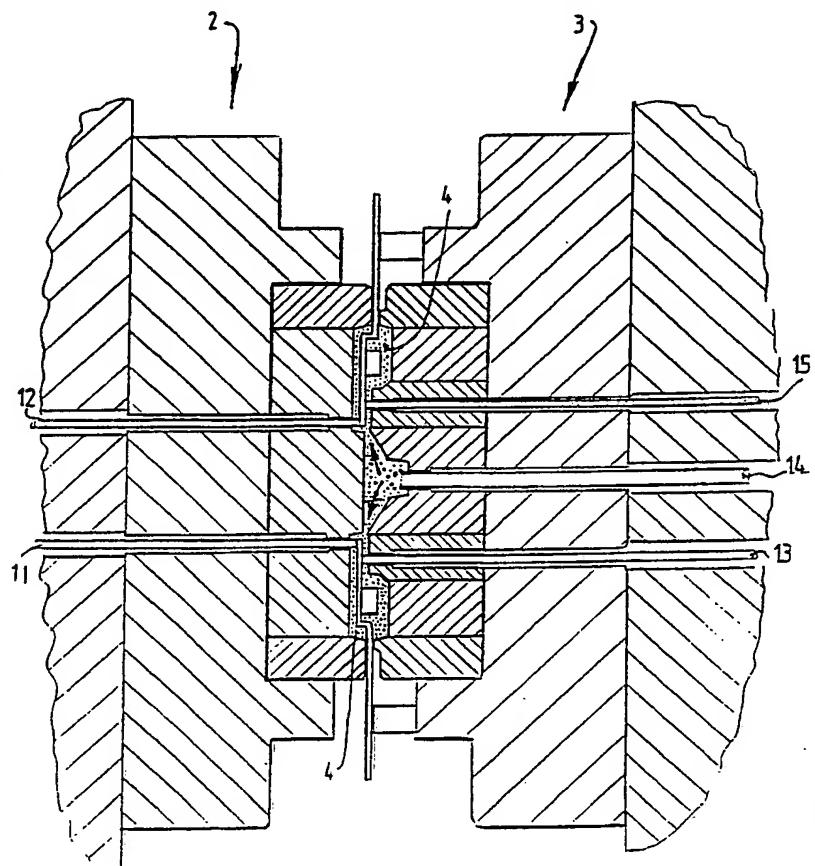
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: APPARATUS FOR MOULDING A LEAD FRAME AND CHIPS ARRANGED THEREON

## (57) Abstract

In an apparatus for moulding with encapsulating material a lead frame and chips arranged thereon, the lead frame is not only supported in the mould cavity defined by the mould halves by clamping of the edge zones of the lead frame but also centered by means of ejecting pins. Ejecting pins have the function of ejecting the lead frame out of the mould cavity after completion of the moulding cycle. An additional support is obtained by placing the pins onto the lead frame during moulding. Shortly before the end of the moulding cycle the pins are retracted from the frame in order to enable filling with plastic of the space formerly occupied by the ejecting pins.



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**APPARATUS FOR MOULDING A LEAD FRAME AND  
CHIPS ARRANGED THEREON**

The invention relates to an apparatus for moulding with an encapsulating material, for instance plastic, a lead frame and chips arranged thereon, comprising mould halves enclosing a mould cavity, a feed runner for liquid moulding material, means for respectively opening and closing the mould halves and pins oriented to the lead frame, connected to the mould halves and movable in relation to the relevant mould half for exerting an ejecting force on the lead frame after moulding.

With such an apparatus lead frames and the chips arranged thereon are encapsulated with plastic. To this end the lead frame is clamped between both mould halves and the mould cavity is injected full of liquid plastic. After hardening the frame encapsulated with plastic is released from the mould by means of the ejecting pins.

In addition to clamping the side edges of the lead frame between the mould halves, it is desirable during moulding to additionally centre the unattached portion of the lead frame on which the chip is also mounted. There is the danger that under pressure of the liquid moulding material the frame will be bent or otherwise damaged by forces exerted thereon.

It is therefore the object of the invention to provide means to additionally support the lead frame with the chip mounted thereon.

This is achieved by displacing means for displacing the pins between a position on the lead frame and a position at a distance from the lead frame.

By moving the ejecting pins onto the frame during moulding an additional support of the lead frame with the chip mounted thereon is obtained using the pins. Shortly before the end of the moulding process the pins are

retracted from the frame in order to ensure that the plastic also fills up the space formerly occupied by the ejecting pins.

After the moulding cycle the mould is opened in the known manner and the ejecting pins fulfil their original function, that is, releasing the moulded lead frame from the mould.

Such ejecting pins are preferably arranged on each of the mould halves.

10 The displacing means can be formed by an actuating member connected to a slide piece receiving the ejecting pins and standing under bias.

The bias can be derived from a coil spring.

15 The position of the ejecting pins on the lead frame is defined by a stop member. This stop may be arranged on the mould half remote from the relevant mould half.

The invention will be further elucidated with reference to the annexed drawings.

In the drawings:

20 Fig. 1 shows a perspective view of the apparatus according to the invention,

fig. 2 shows a cross sectional view of the apparatus along the line II-II in fig. 1;

25 fig. 3 shows in perspective view a part of a lead frame already partially encapsulated in the apparatus according to fig. 1 and 2,

fig. 4-7 show schematically the successive process steps of the apparatus according to the invention.

30 The apparatus 1 comprises mould halves 2 and 3 which enclose the mould cavity 4. Mould half 2 is stationary and mould half 3 is movable in relation to mould 2 as according to arrow P1 and is guided therein by the guide rods 5 and 6. Mould half 3 is connected for this purpose to the pressure plate 7 using connecting pieces 8.

35 Displaceable relative to each of the mould halves is an ejecting pin bed 9 respectively 18 which carries the ejecting pins 11, 12, respectively 13, 14 and 15. The slide piece 9 for instance stands under bias of the coil spring 16

which confers on the slide piece 9 a bias force directed toward the mould space 4. Liquid moulding material is introduced via the runner 20

When, after moulding, the mould half 3 opens the cavity space 4 because this mould half is moved downward according to arrow P1 in the drawing as in fig. 1 and 2, the slide piece 9 is released whereby it is likewise moved downward relative to the mould half 2 under the influence of the bias force exerted by the spring 16, wherein the pins 11 and 12 fulfil their ejecting function by applying a force to the moulded lead frame. The same function is subsequently fulfilled by the ejecting pins 13 and 15 in the other mould half.

According to the invention the slide piece 9 is connected to the displacing means in the form of an actuating rod 17. The same provision is likewise arranged vice-versa in respect of the slide piece 18 in the other mould half. The actuating rod is designated here with the reference numeral 19.

Using the actuating rod 17 the slide piece 9 is displaced in the direction of the mould cavity 4 such that the ejecting pins 11 and 12 come to lie against the lead frame. The movement is bounded by a stop member (not drawn) on the other mould half 3. This is shown in fig. 3. The same applies for the pins 12 and 15, this being brought about by the slide piece 19. The lead frame is thus supported because it is clamped on the side edges by the mould halves 2, 3 and because it is further centered by the ejecting pins referred to in the foregoing. The liquid plastic which serves as encapsulating material is then supplied (fig. 4) through the runner 20. At the end of the injection operation the pins and the runner 14 are retracted in order to enable filling with plastic of the space formerly occupied thereby. This displacement takes place through operation of the actuating rods 17 and 19 (fig. 1).

The movable mould half 3 is subsequently moved to the right in fig. 6 whereby the mould cavity is opened. The slide piece 9 is also released, whereby it moves to the

right under influence of the bias provided by spring 16, and the ejecting pins 11 and 12 can perform their releasing action.

After the mould half 3 has moved completely to the right the ejecting pins 13 and 15 are released whereby the moulded lead frame is also released from the other mould half 3. The moulding cycle is then completed.

**CLAIMS**

1. Apparatus for moulding with an encapsulating material, for instance plastic, a lead frame and chips arranged thereon, comprising mould halves enclosing a mould cavity, a feed runner for liquid moulding material, means 5 for respectively opening and closing the mould halves and pins oriented toward the lead frame, connected to the mould halves and movable in relation to the relevant mould half for exerting an ejecting force on the lead frame after moulding, characterized by displacing means for displacing 10 the pins between a position on the lead frame and a position at a distance from the lead frame.

2. Apparatus as claimed in claim 1, characterized in that ejecting pins are arranged on each of the mould halves.

3. Apparatus as claimed in claim 1, characterized in 15 that the displacing means are formed by an actuating member connected to a slide piece receiving the ejecting pins and standing under bias.

4. Apparatus as claimed in claim 3, characterized in that the bias is derived from a coil spring.

20 5. Apparatus as claimed in claim 1, characterized in that the position on the lead frame is defined by a stop member.

6. Apparatus as claimed in claim 5, characterized in 25 that the stop member for defining the position on the lead frame is arranged on the mould half remote from the relevant mould half.

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## AMENDED CLAIMS

[received by the International Bureau on 13 May 1993 (13.05.93);  
original claims 1-6 replaced by amended claims 1-4 (1 page)]

1. Apparatus for moulding with an encapsulating material, for instance plastic, a lead frame and chips arranged thereon, comprising mould halves enclosing a mould cavity, a feed runner for liquid moulding material, means 5 for respectively opening and closing the mould halves and pins oriented toward the lead frame, connected to the mould halves and movable in relation to the relevant mould half for exerting an ejecting force on the lead frame after moulding and displacing means for displacing the pins 10 between a position on the lead frame and a position at a distance from the lead frame, characterized in that the displacing means are formed by an actuating member connected to a slide piece receiving the ejecting pins and standing under bias.
- 15 2. Apparatus as claimed in claim 1, characterized in that the bias is derived from a coil spring.
3. Apparatus as claimed in claim 1, characterized in that the position on the lead frame is defined by a stop member.
- 20 4. Apparatus as claimed in claim 3, characterized in that the stop member for defining the position on the lead frame is arranged on the mould half remote from the relevant mould half.

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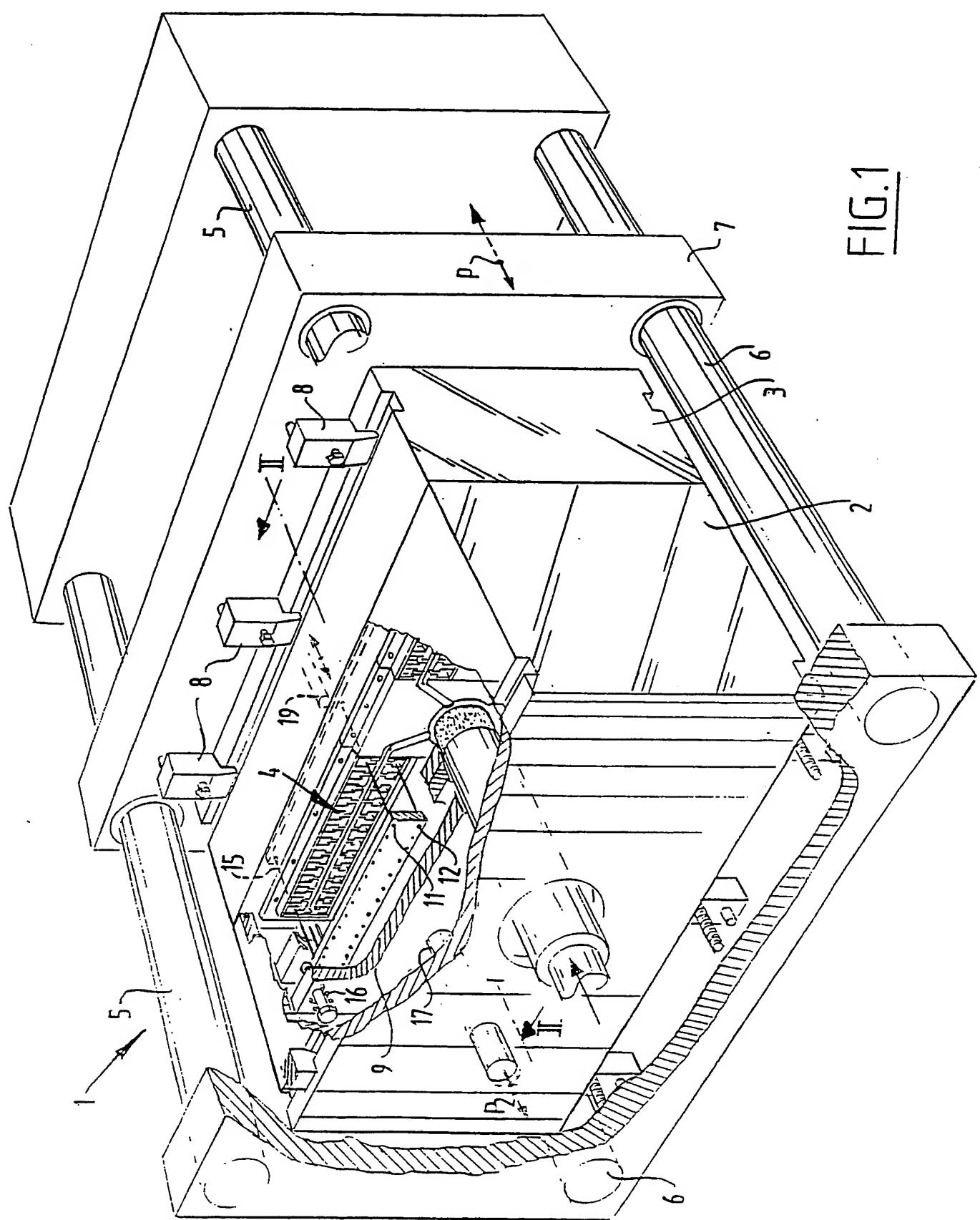
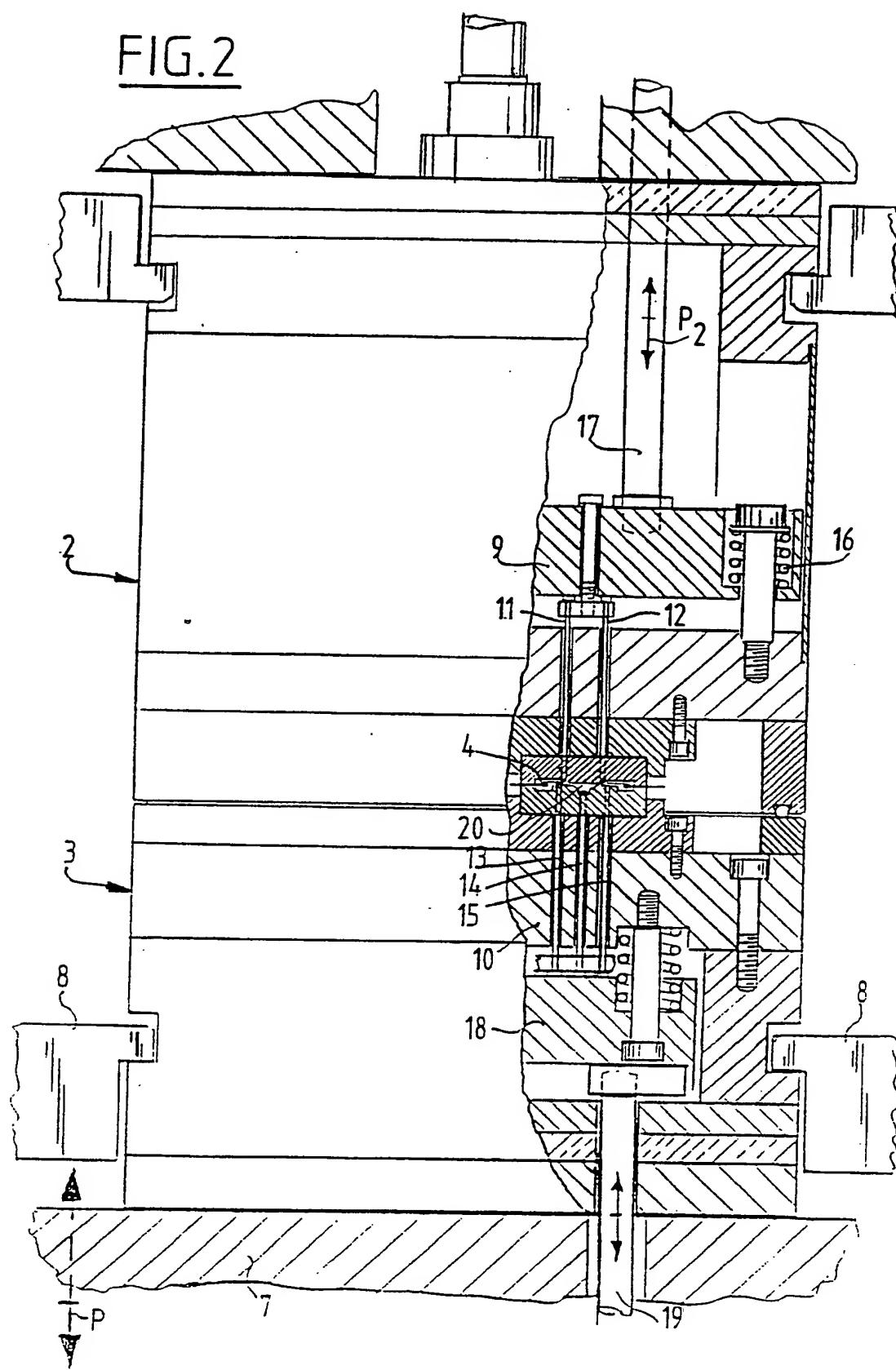


FIG. 1

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FIG.2

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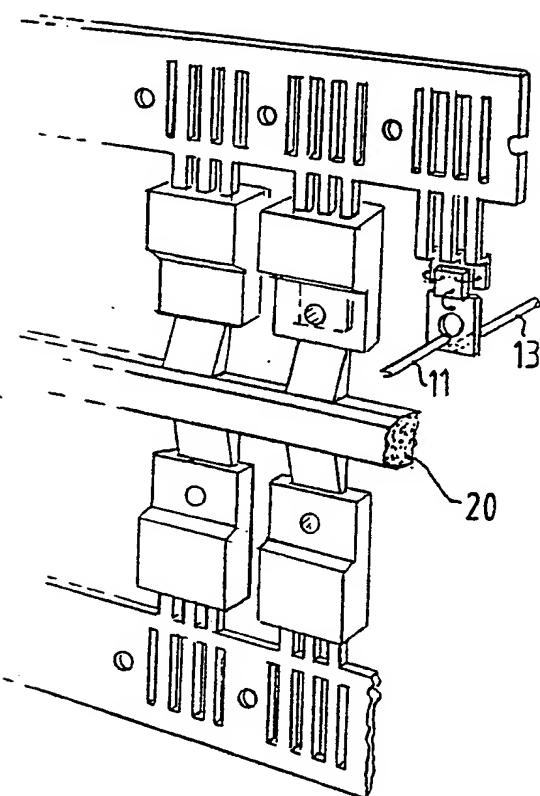
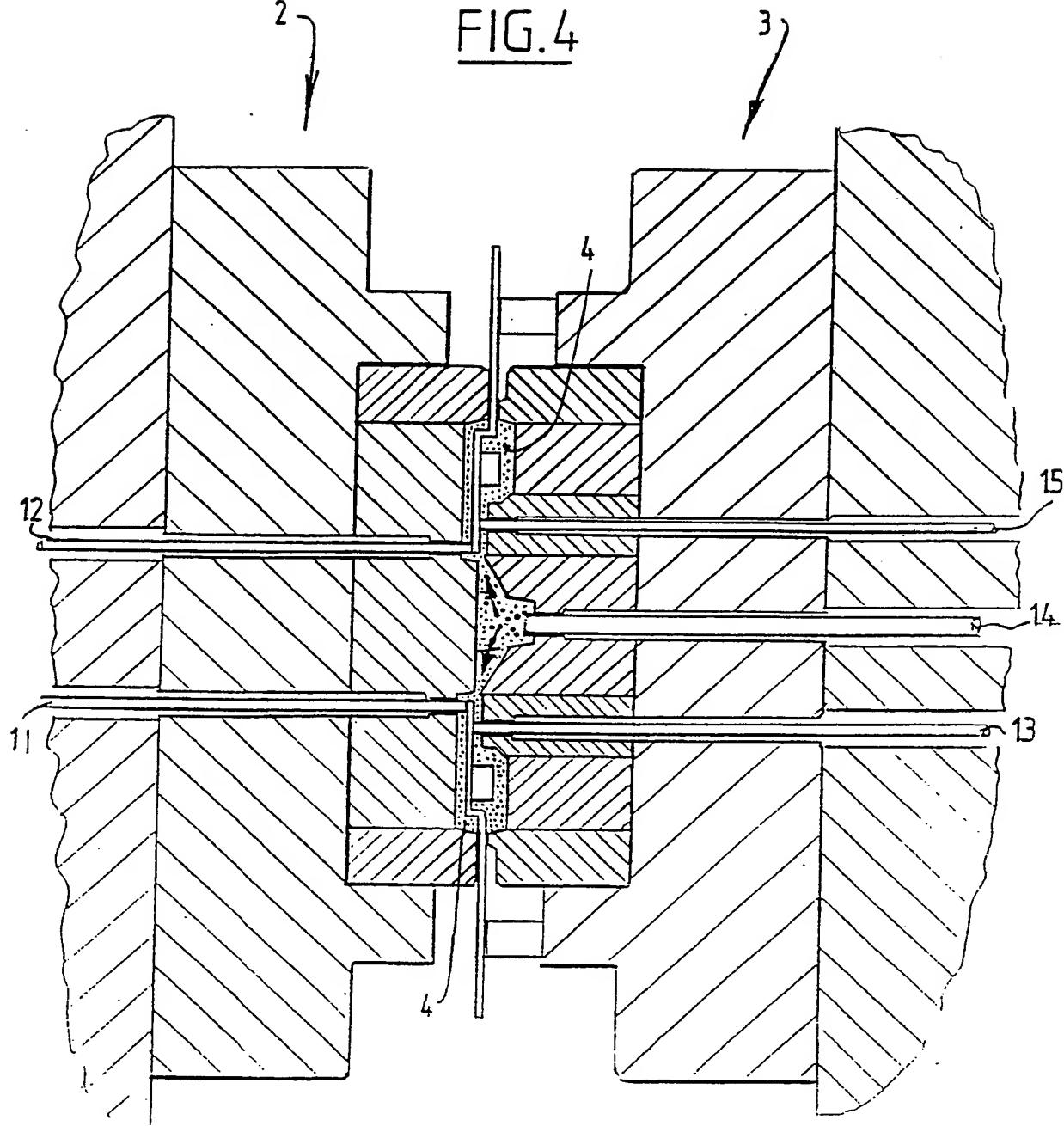


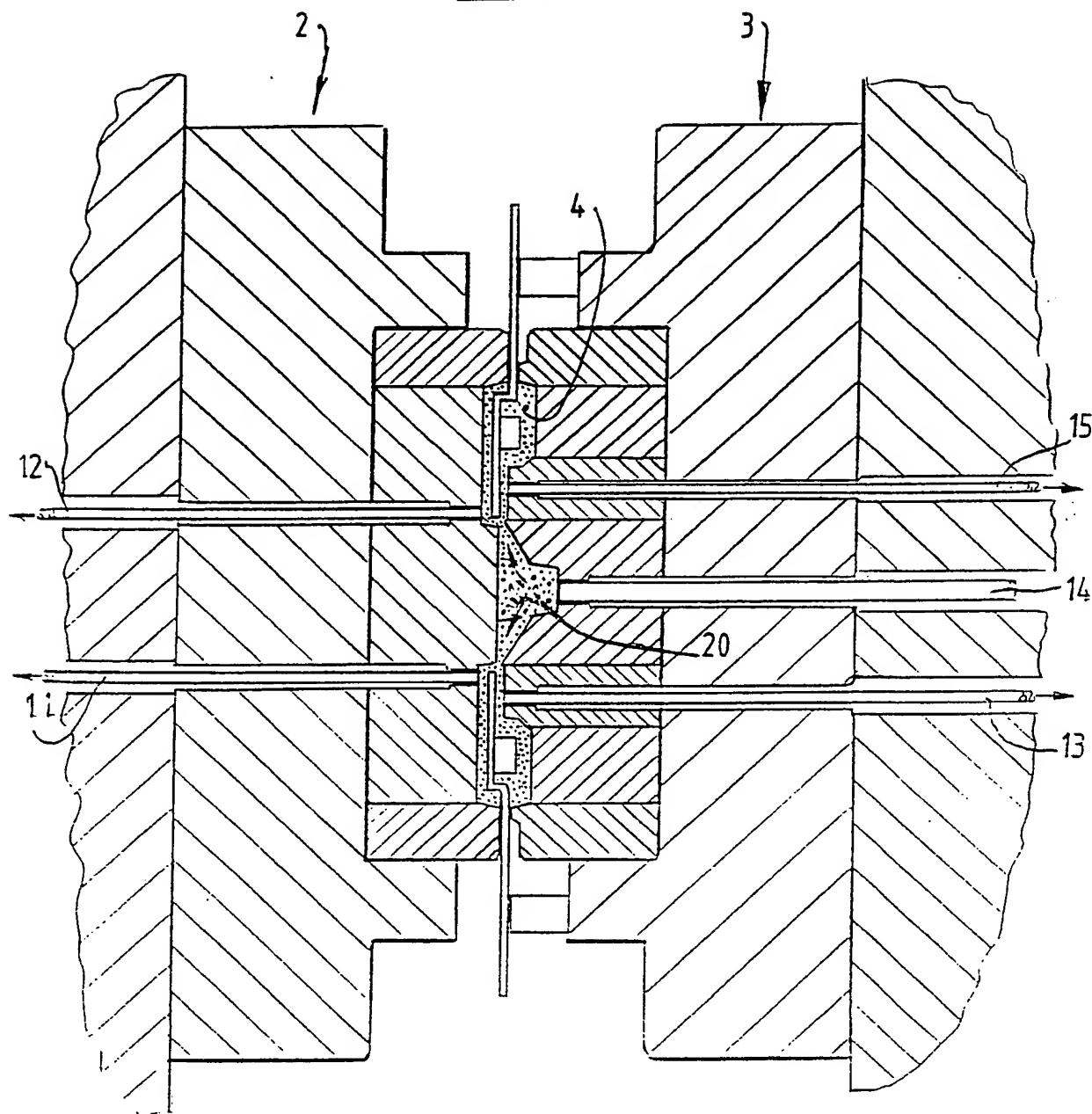
FIG.3

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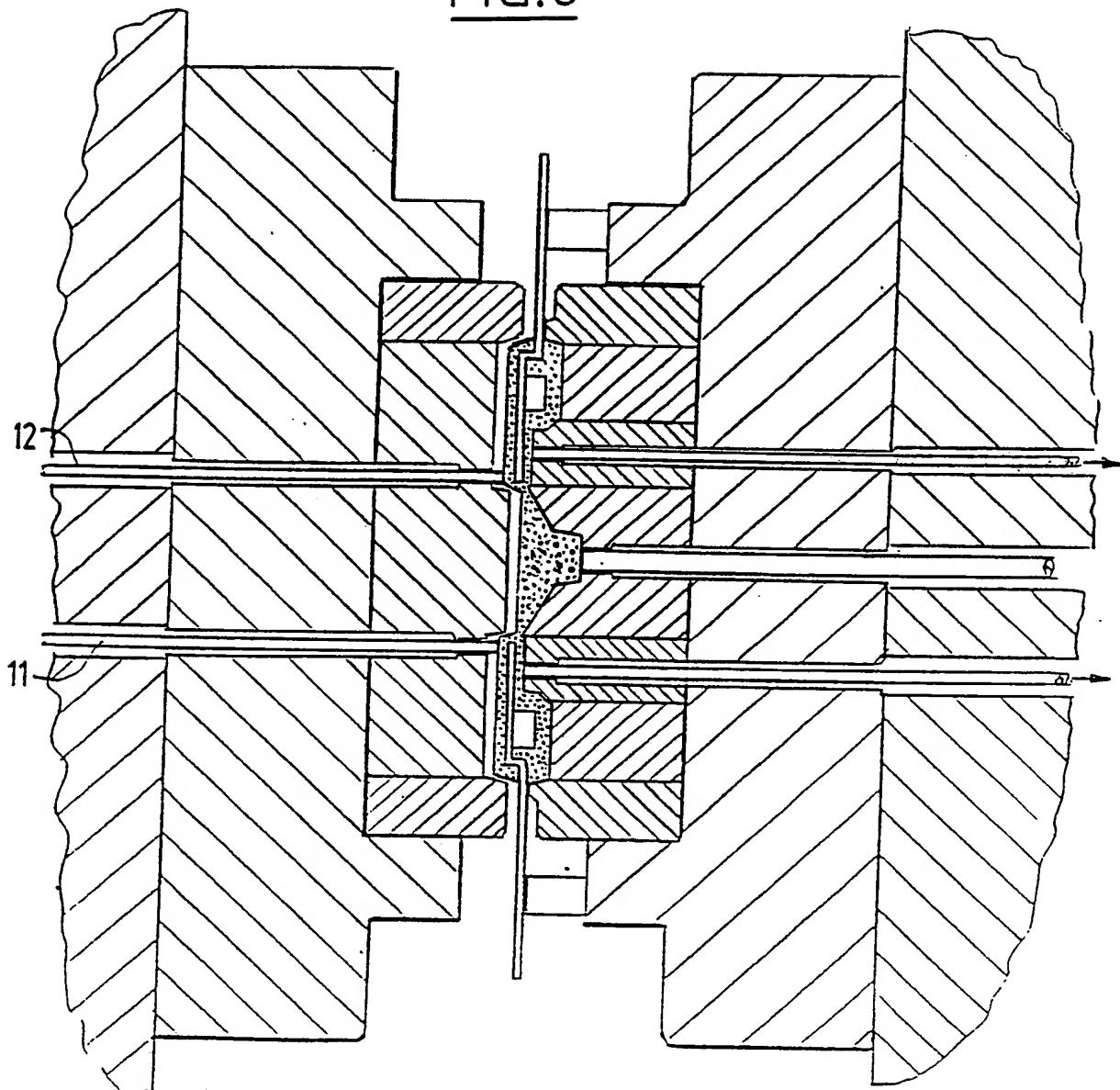
FIG. 4



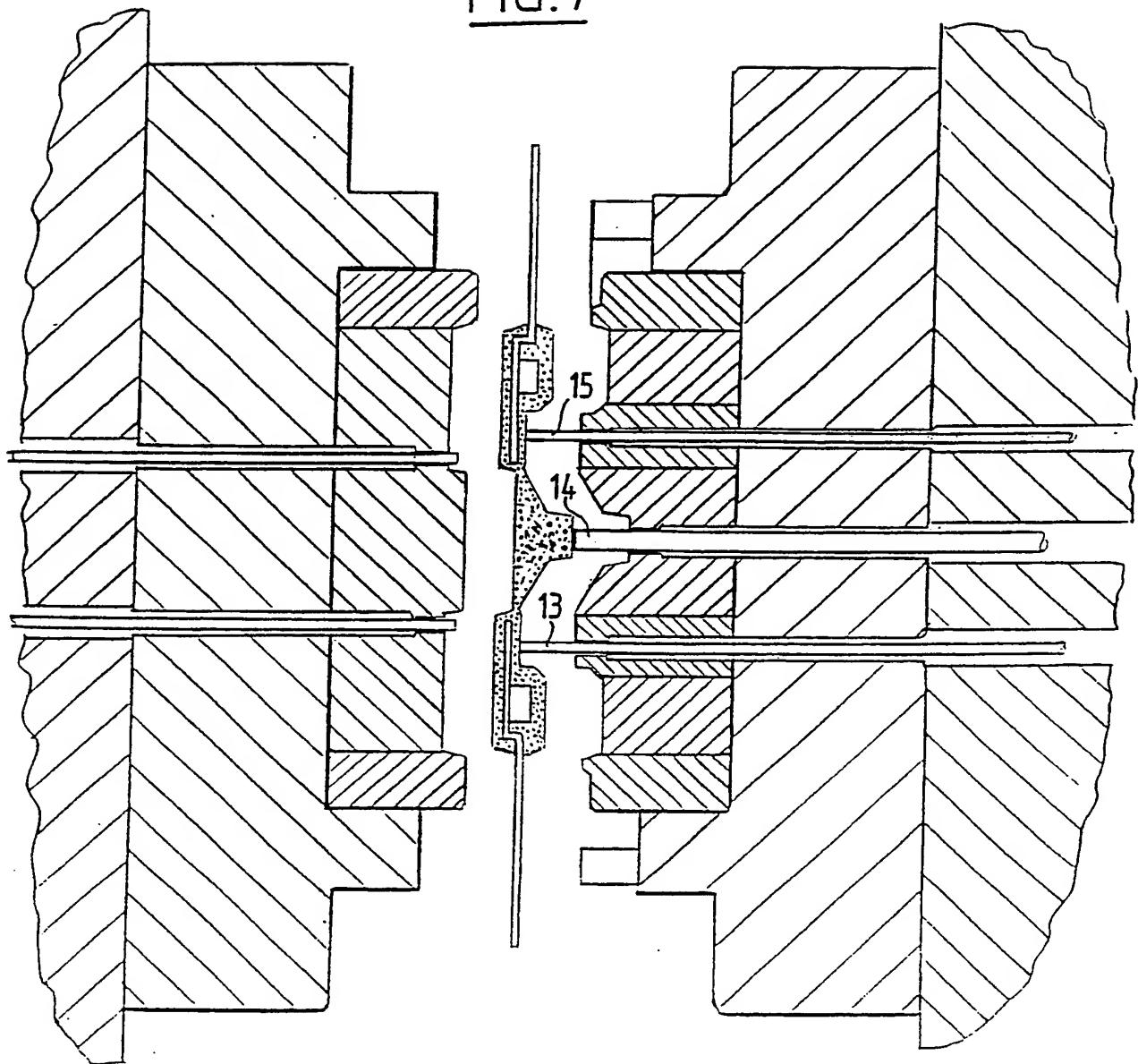
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FIG.5

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FIG.6

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FIG. 7

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 93/00073

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC Int.C1. 5 H05K13/00; H01L21/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
Int.C1. 5	H05K ; H01L	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	EP,A,0 257 681 (SGS MICROELETTRONICA S.P.A.) 2 March 1988 see column 4, line 30 - column 5, line 17; figures 6A-6C ----	1,2
A	GB,A,2 103 534 (OMRON TATEISI ELECTRONICS CO) 23 February 1983 see page 1, line 102 - page 2, line 52; figures 3A-4 -----	1-6
<p><sup>6</sup> Special categories of cited documents :<sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search  02 MARCH 1993	Date of Mailing of this International Search Report  10.03.93	
International Searching Authority  EUROPEAN PATENT OFFICE	Signature of Authorized Officer  BOLDER G.	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

EP 9300073  
SA 68836

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
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02/03/93

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		JP-A-	63062239	18-03-88
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GB-A-2103534	23-02-83	JP-A-	58018222	02-02-83
		JP-A-	58018223	02-02-83
		DE-A,C	3228214	17-02-83
		US-A-	4470786	11-09-84
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